

**“The NAS Report reviewed 10
Ecological studies in neonatal and
pediatric populations (Table 3-1,
pages 61-72)**

“...the available epidemiologic evidence is not consistent with a causal association between perturbations of thyroid hormone and TSH productions in normal newborns ... and exposure during gestation to perchlorate in drinking water up to 120 ppb...” (page 72)



Perchlorate



Studies of Possible Effects of
Perchlorate
Naturally Occurring
in Northern Chile

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Does perchlorate in drinking water affect thyroid function in newborns or school age

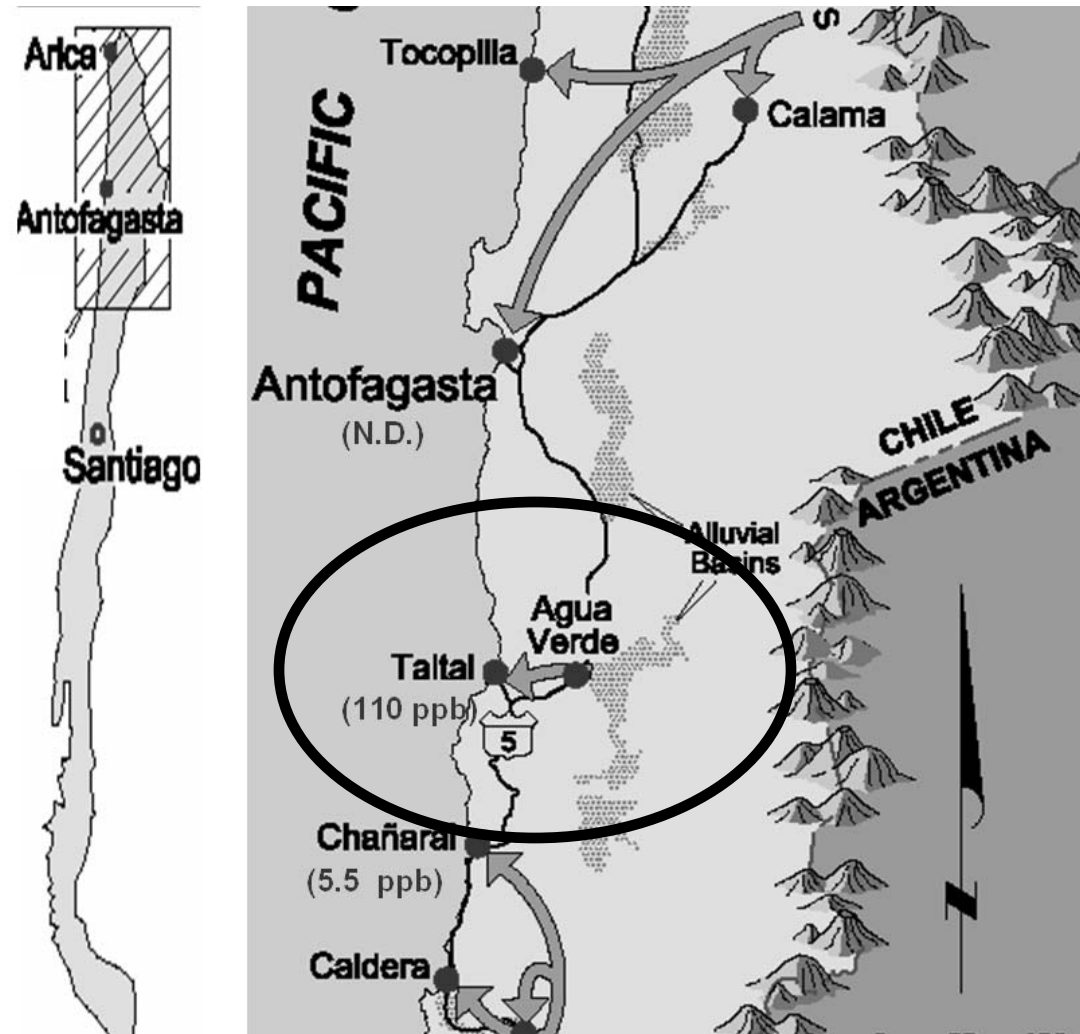
Journal of Occupational and Environmental Medicine, 2000

Crump K, Michaud P, Tellez R, Reyes C,
Gonzalez G, Montgomery EL, Crump KS,
Lobo G, Becerra C, Gibbs JP.



PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Naturally Occurring Perchlorate in Chile Characterized



Taltal Water



Taltal 100-120 ppb perchlorate



Chanaral 6ppb perchlorate



Hospital - Chanaral



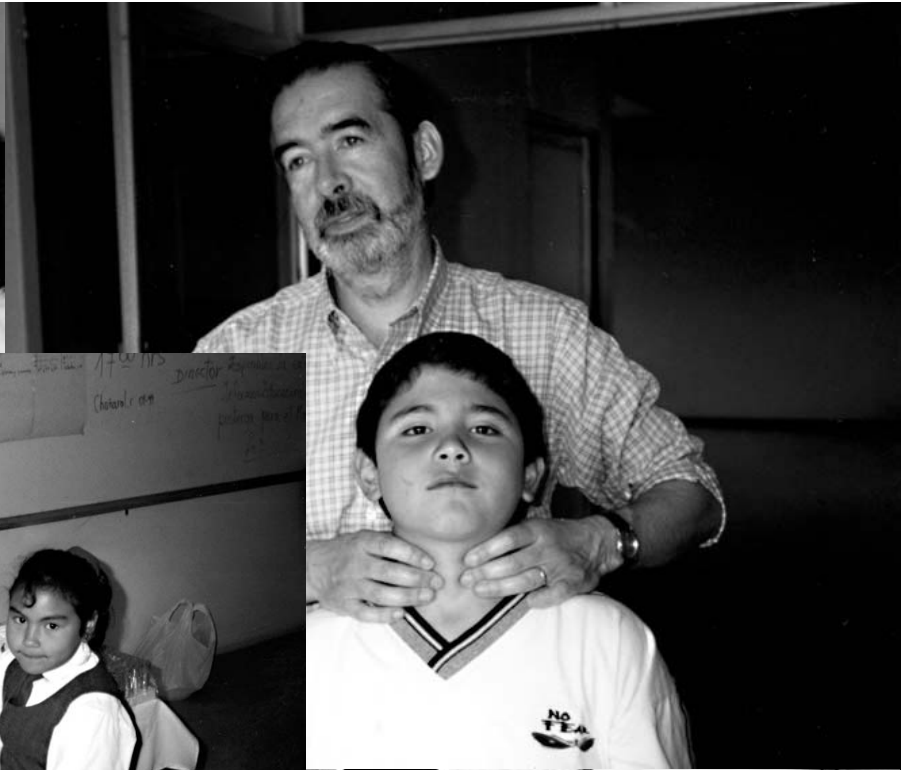
Antofagasta (perchlorate non-detectable)



Clinic - Antofagasta

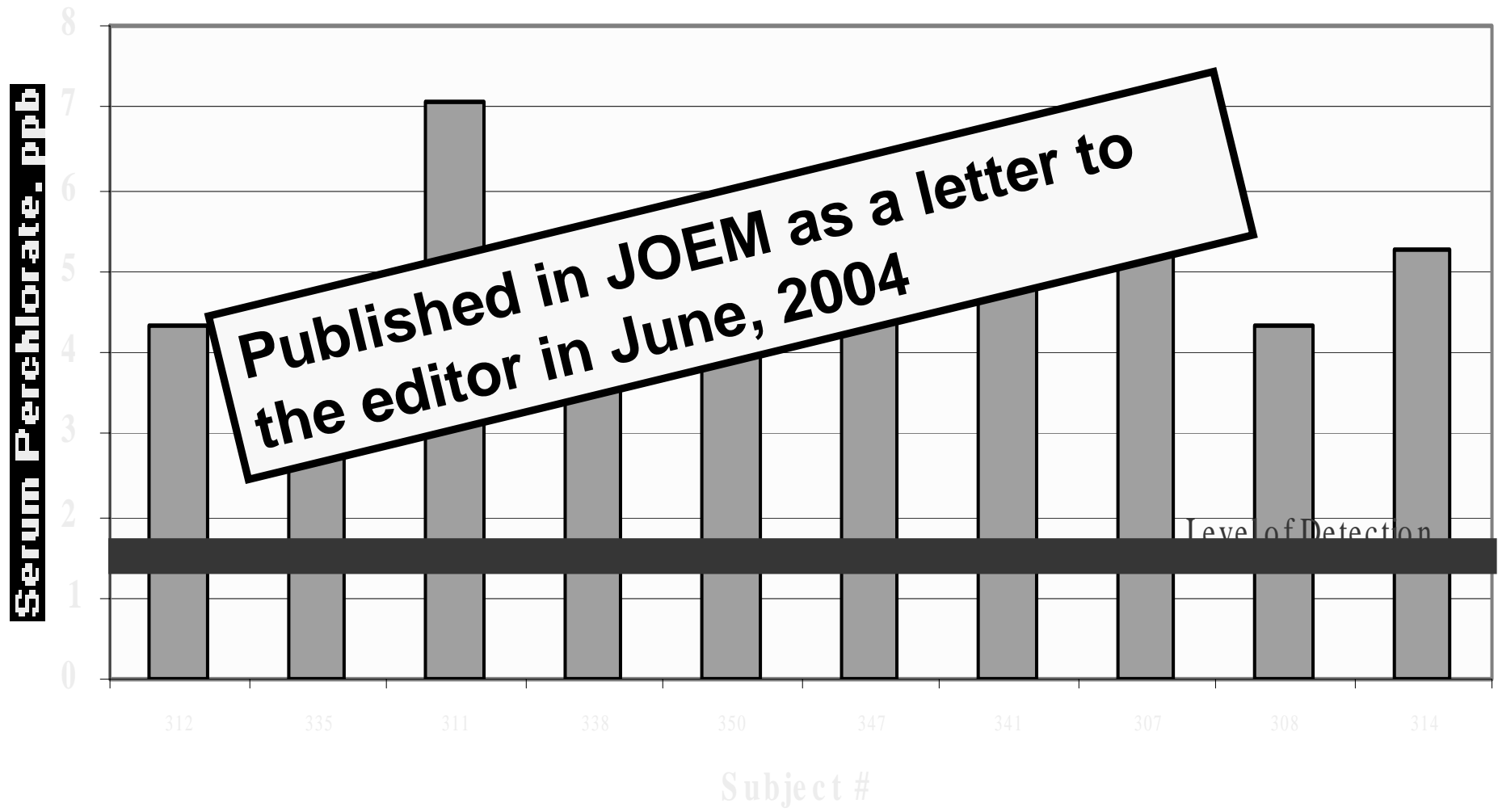






Taltal, Serum Perchlorate

Mean = 5.0, STD=1.0



“The committee thinks that the study of Crump et al. (2000) had important strengths.” p 66-69,

- *“Although individual exposures were not assessed, it is one of the few studies that measured perchlorate in drinking water in samples taken directly from the environment of the children studied, such as homes and schools”.*
- *“All laboratory assessments were done at the same facility”*
- *“...assessments of thyroid status and other measures were done by observers unaware of the perchlorate exposure of the children.”*
- *“On the basis of the iodide-inhibition analyses,... and a review of information on urinary iodide excretion, the committee concluded that the data from Chile could be considered in the evaluation of the U.S. experience with perchlorate in drinking water.”*

CHRONIC ENVIRONMENTAL EXPOSURE TO PERCHLORATE IN DRINKING WATER AND THYROID FUNCTION DURING PREGNANCY AND THE PERINATAL

**IN PRESS – THYROID
slated for September 05 edition**

Rafael Tellez, Patricio Michaud Chacón, Carlos
Reyes Moraga, Kenny S. Crump, John P. Gibbs



PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

Impacts of Moderate to Severe Iodine Deficiency during Pregnancy

Maternal & Neonatal Outcomes

Increased

- TSH
- Thyroglobulin

Decreased

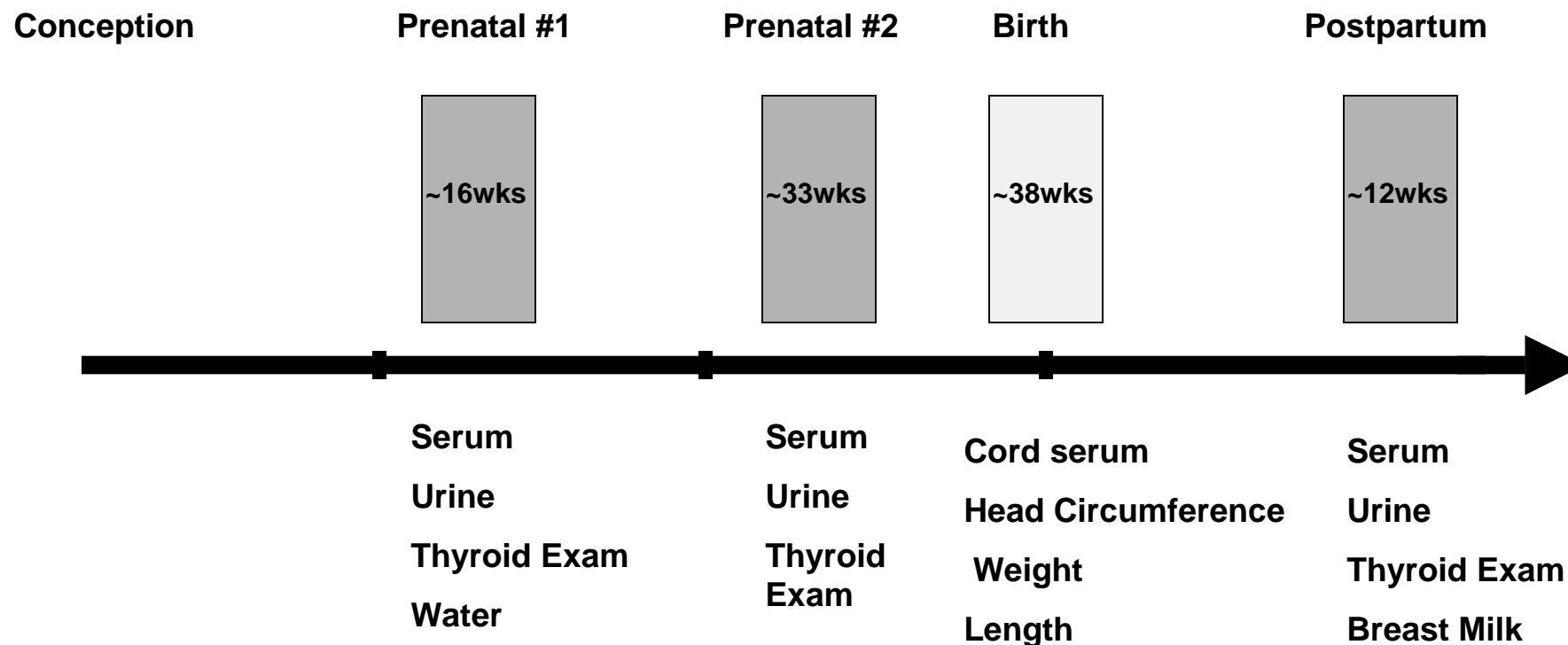
- Free T4

Neonatal Outcomes

Decreased

- Birth weight
- Length
- Head circumference

Chile II: Pregnant Women Study Design



Data Collected

SERUM: T3, fT4, TSH, Tg, a-TPO, a-Tg

URINE: Iodine, creatinine

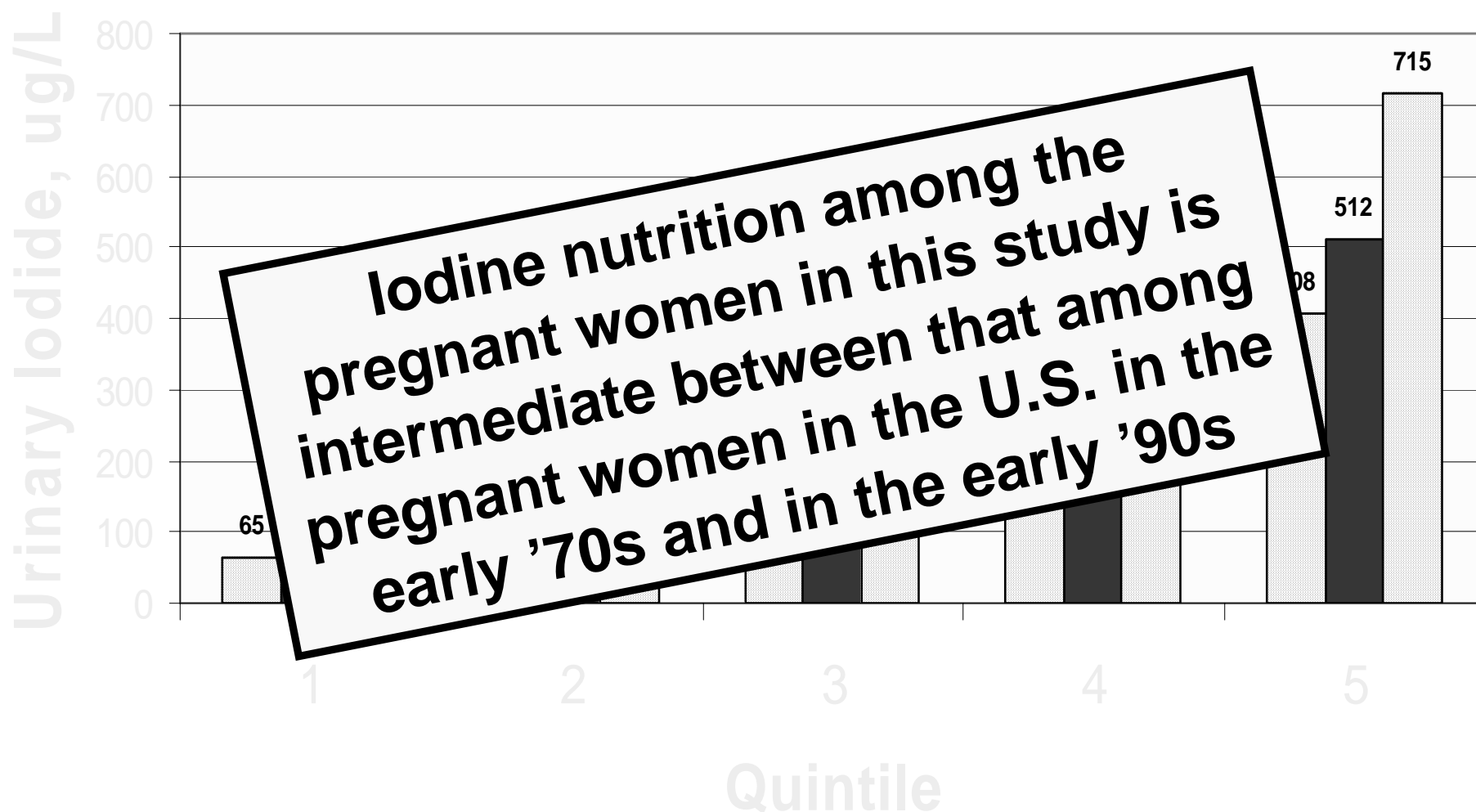
WATER: perchlorate

BIOLOGICAL MONITORING: serum, urine, milk samples



Urinary Iodine Chile vs the U.S.

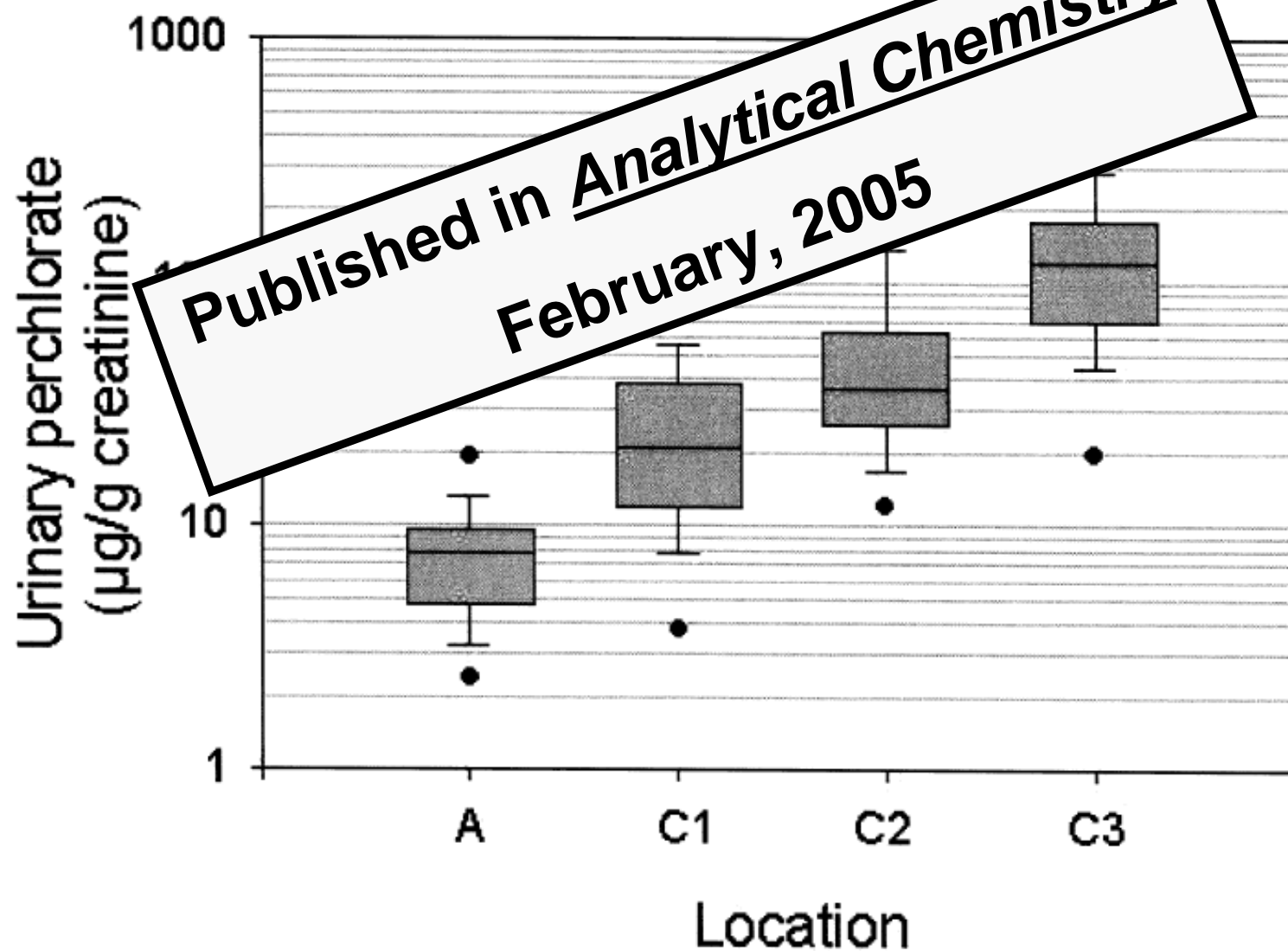
□ NHANES III, N=292 ■ Chile, N=171 □ NHANES I, N=199



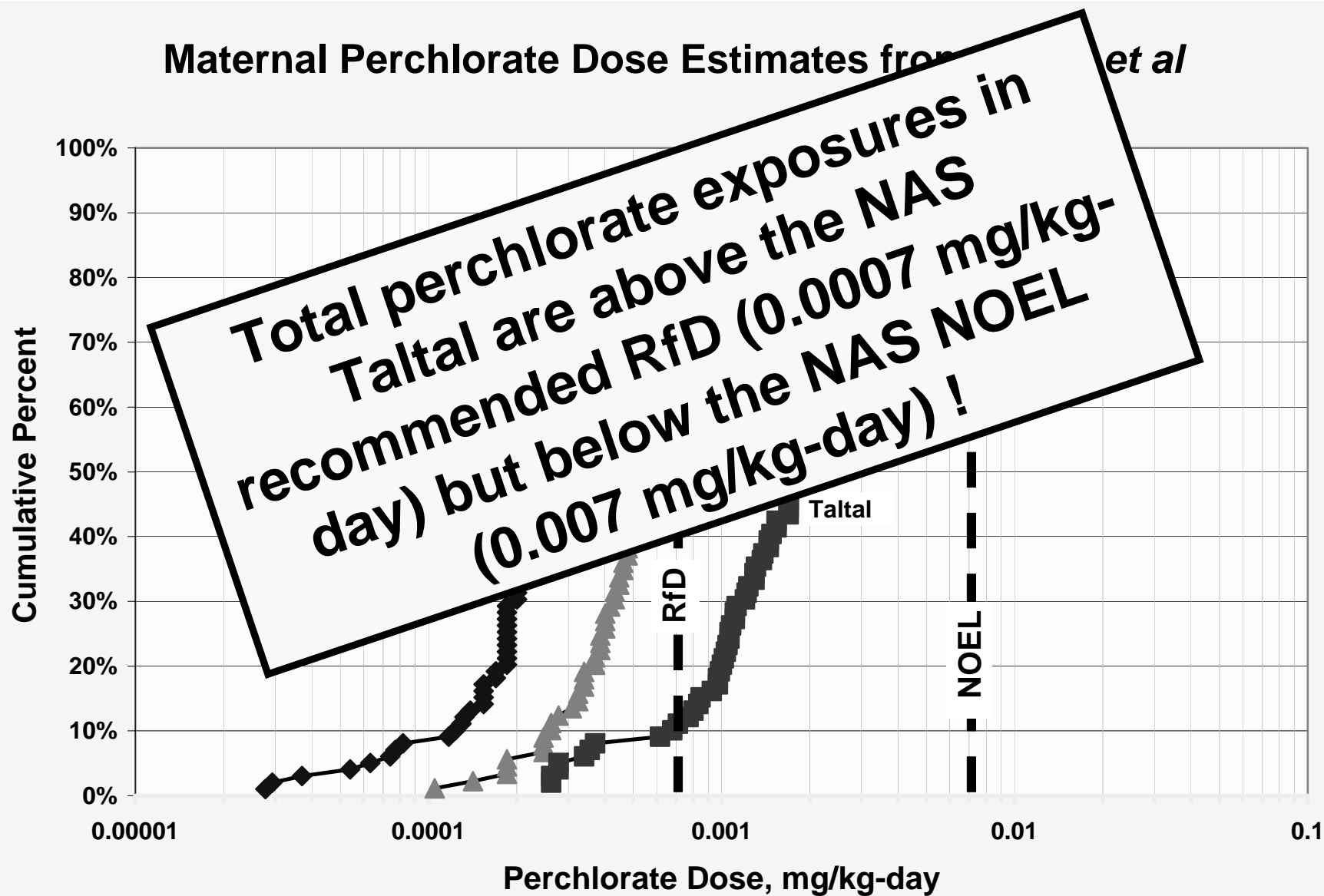


Department of Health and Human Services

Centers for Disease Control and Prevention



Maternal Perchlorate Dose Estimates from *et al*



Analysis of Dietary and Drinking Water Sources of Perchlorate

	Antofagasta	Chañaral	Taltal
Median tap water consumption, L/day	0.84	1.06	0.82
Tap water perchlorate, μ g/L	138	114	114
Perchlorate consumption, μ g/day			93.5
Median perchlorate excretion, μ g/day			110
Creatinine excretion, mg/day	1.08	1.08	1.08
Median Perchlorate excretion, μ g/day	22.1	40.0	118.8
Perchlorate from food, μ g/day (urine excretion minus water consumption)	21.7	33.8	25.3

Median perchlorate excretion exceeded median tap water perchlorate consumption by approximately the same amount in all three cities, most likely reflecting dietary intake.

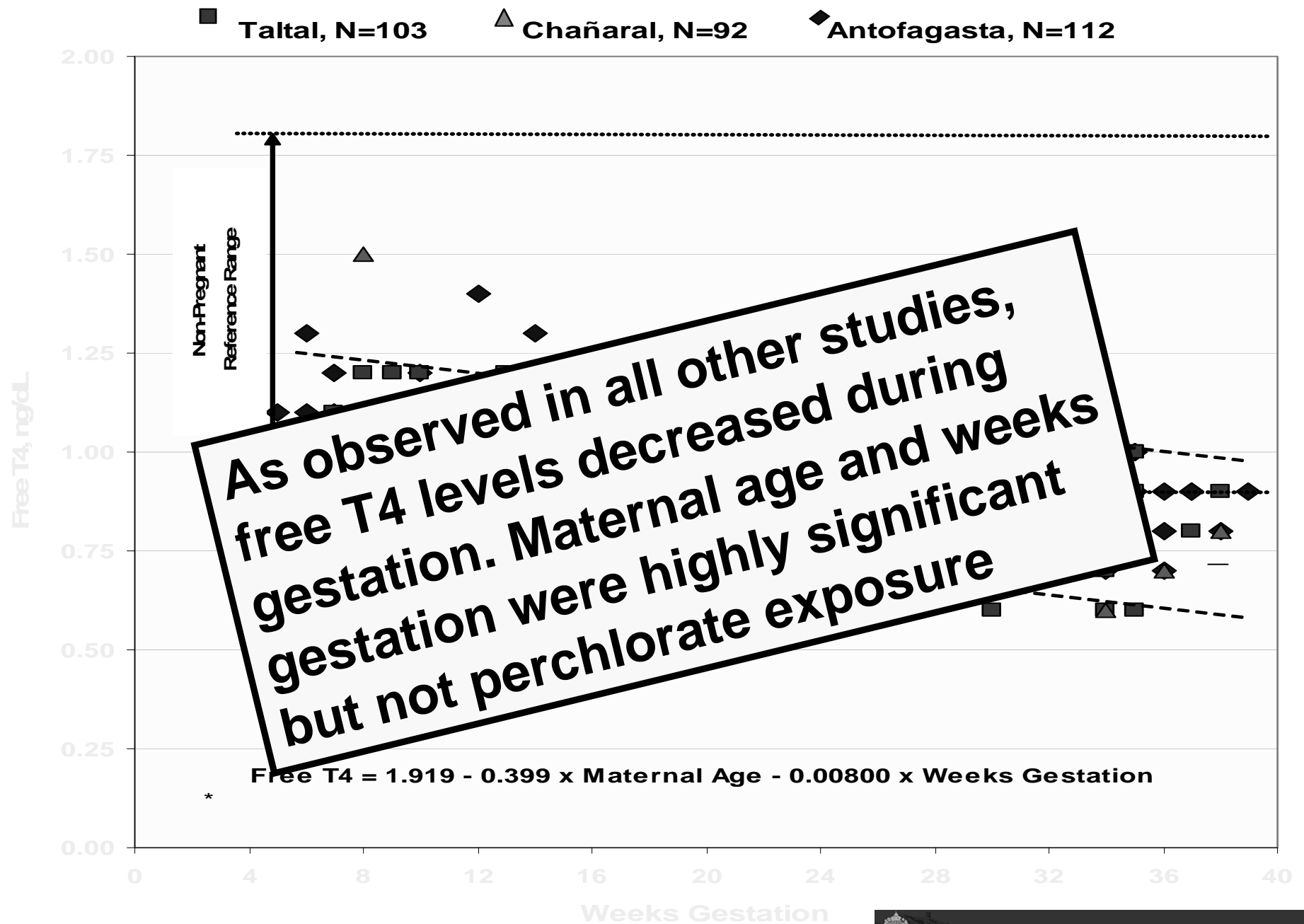
First Prenatal Visit

	Antofagasta		Chañaral		Taltal		
	N	Mean	N	Mean	N	Mean	p*
FreeT4 (ng/dL)							0.25
TSH (μ UI/ml)					64	2.61	0.91
Thyroglobulin (ng/ml)		4.32	45	3.67	57	3.67	0.32
Iodine/g creatinine	61	391	38	355	57	322	0.06

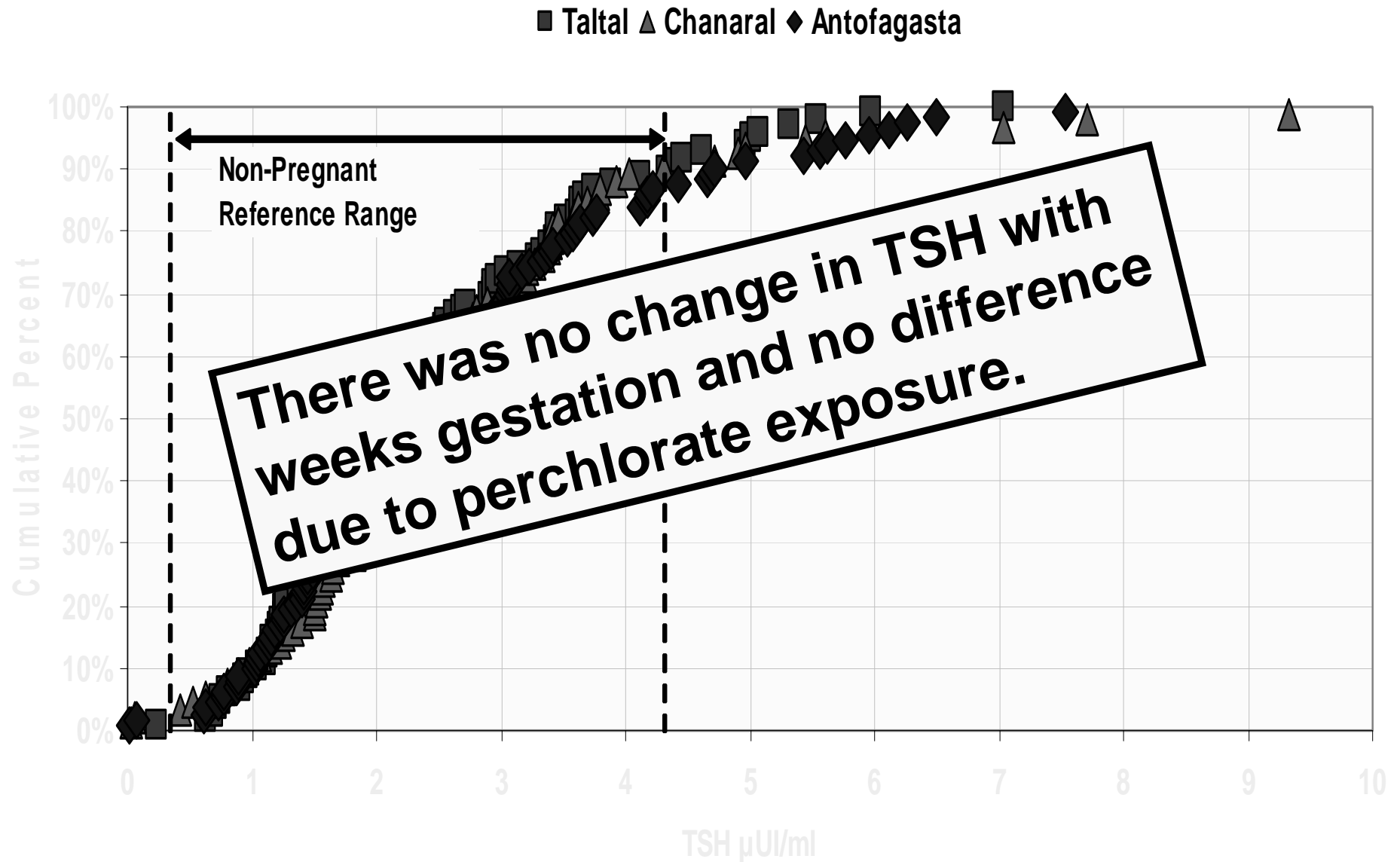
Maternal thyroid status during early pregnancy was unaffected by the perchlorate exposures.

*Kruskal Wallis

Maternal Free T4 vs Weeks Gestation



Maternal TSH, Cumulative Distribution



Neonatal (Cord Blood)

	Antofagasta		Chañaral		Taltal		
	N	Mean	N	Mean			p*
FreeT4 (ng/dL)					1.03		0.73
TSH (μ UI/ml)			40	6.69	28	6.31	0.99
Thyroglobulin (ng/ml)	30	16.8	36	14.0	28	18.1	0.29

The infant's thyroid function at birth was unaffected by the perchlorate exposures

*Kruskal-Wallis

Neonatal Characteristics

	Antofagasta	Chañaral	Taltal	p-value*
Gestational				0.01
Length, cm				0.98
Weight, g				0.30
Head Circumference	35.1	50	34.7	0.32

There were no differences in neonatal weight, length or head circumference related to perchlorate exposure.

The slightly longer gestation in Antofagasta is likely due to lower maternal age and parity in that city.

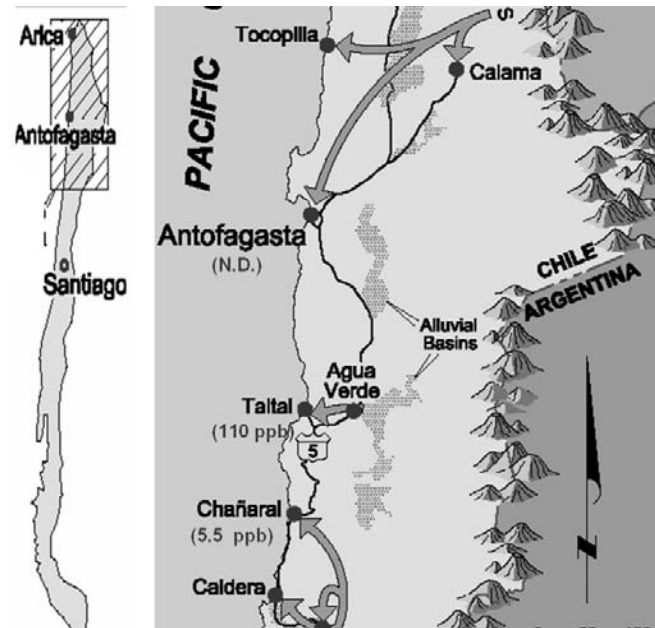
*Kruskal-Wallis

Neonatal Birth Weight, grams (NS)

Percentile	N	5%	10%	25%	50%	95%
Antofagasta	52					306
Chanaral						38
Taltal						
NHANES III		2440	2680	3030	3360	4195
					3350	3740 4055 4090

The distribution of neonatal birth weight was not different due to perchlorate exposure and not different from that in the U.S. in the early 90's

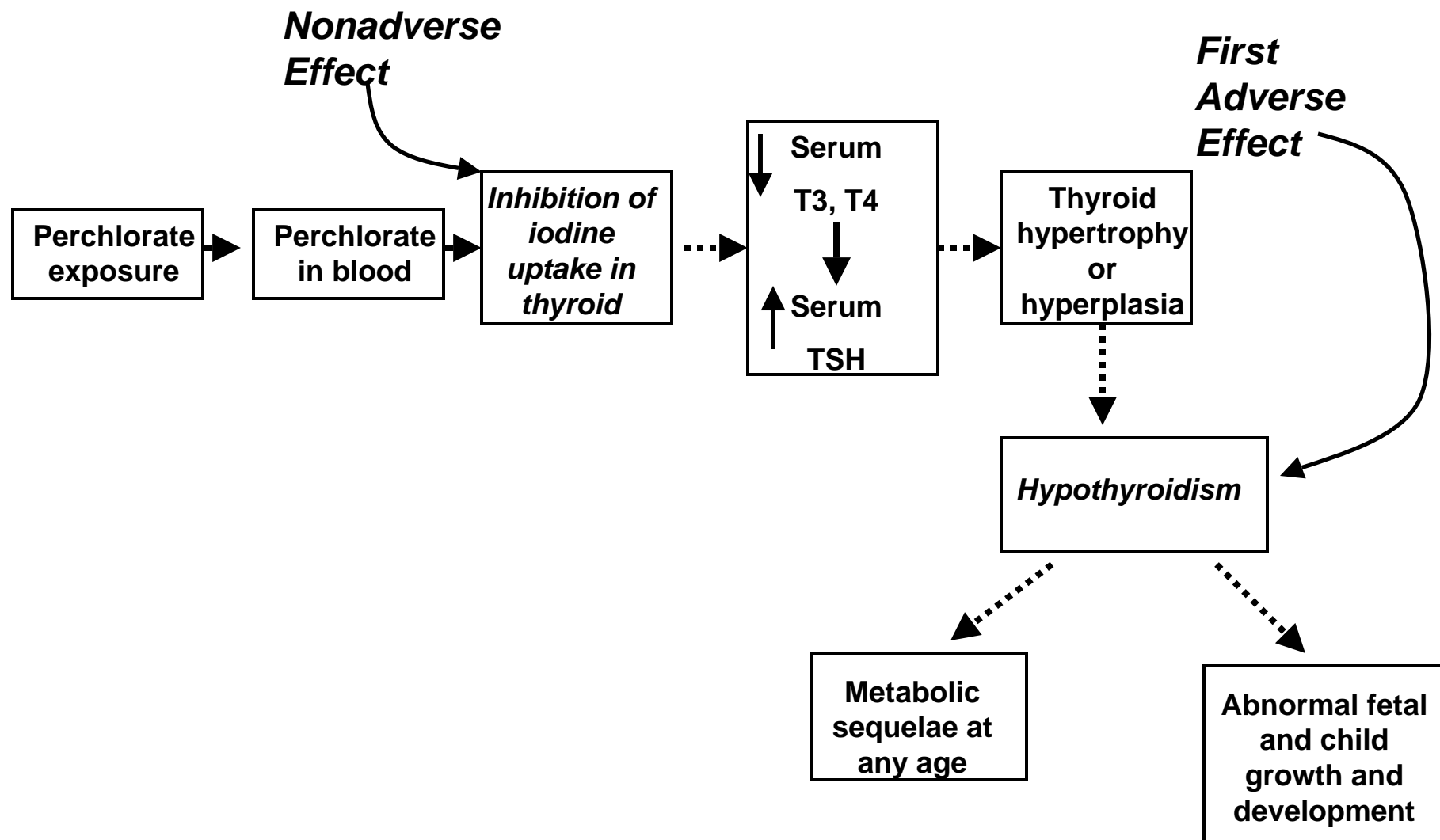
Thank You



Breast Milk Analysis

CITY	Iodine, $\mu\text{g/dL}$					Perchlorate, $\mu\text{g/dL}$		
	P.5	P.50	P.50	P.50	P.50	P.5	P.50	P.75
ANTOFAGASTA	25	65	104	127	150	<0.5	8	29 37 46
TALTAL	25	65	104	127	150	27 38 48		
CHANARAL	16	<0.5	19	29	35	26 30 43		

Breast milk iodine levels are not impacted by maternal perchlorate exposures



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